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IDENTIFIERS *American River College CA

ABSTRACT

By a community effort, an articulated electronics training program for junior high school through community college was developed and implemented in Sacramento, California. The need for such a program became obvious when analysis of job projection statistics revealed that industries in the area would require far more electronics technicians than were being prepared by the schools, while studies of students' vocational preferences showed career choices in such fields as doctor, actor, and pilot, where job opportunities were few. Representatives of industry, the American River Community College, high school and regional school district administrations, and high school teachers cooperatively developed and implemented plans for revamping the electronics curriculum for the community college, five high schools, and one junior high school. It was decided that the junior high should provide exposure to careers in electronics for minorities, handicapped, disadvantaged, and female students, while the high school should concentrate on basic electronics courses and the community college would prepare entry-level technicians with associate degrees. It was further determined that the basic electronics course at the college could be skipped by high school graduates from participating schools if they could pass the college course final examination. The project was rated a success in attracting more students into the field, in clarifying the role of high school electronics courses, in assisting with the community college curriculum revision, and in promoting cooperation among the institutions and persons involved. (KC)

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A COMMUNITY APPROACH

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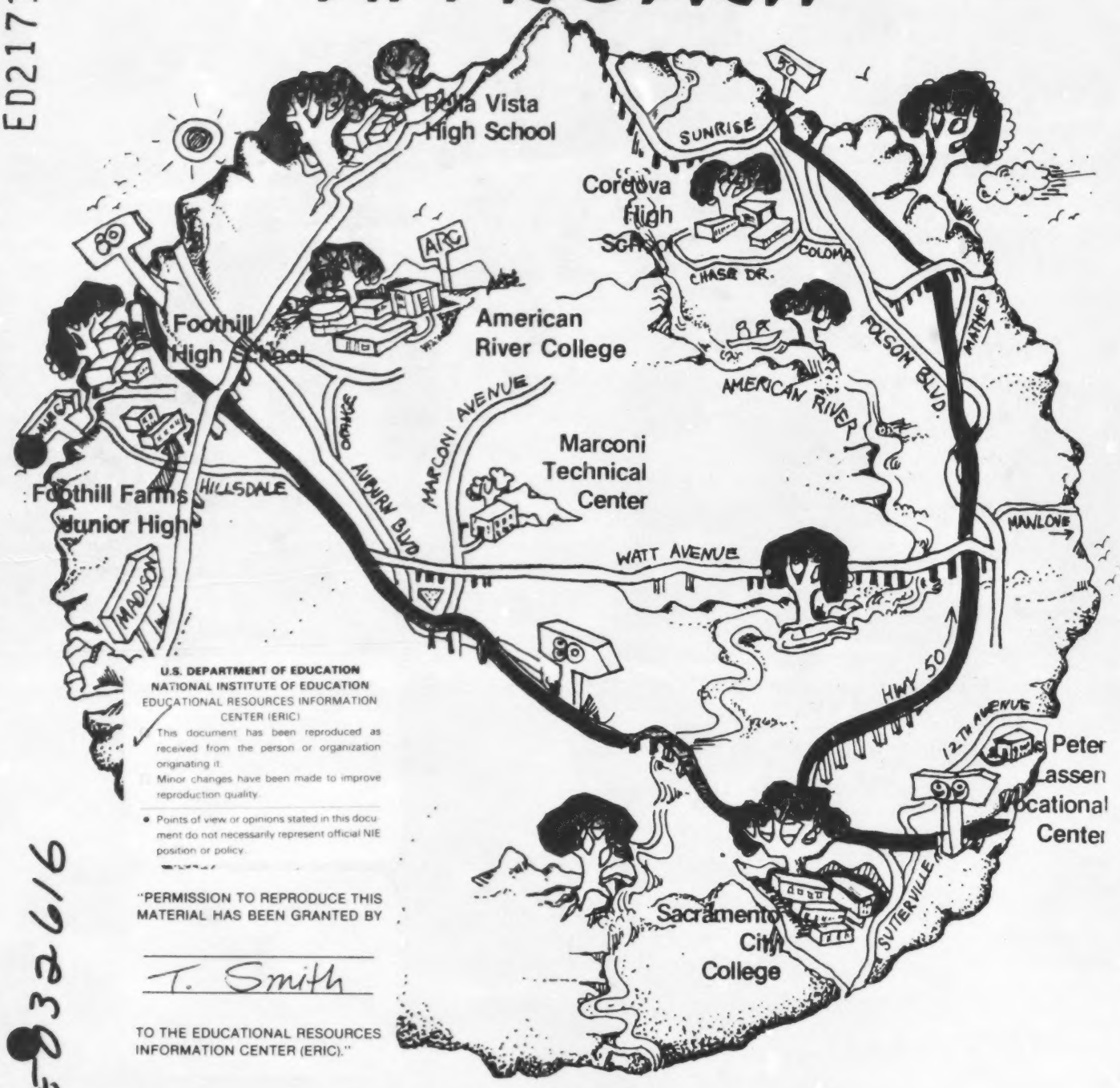

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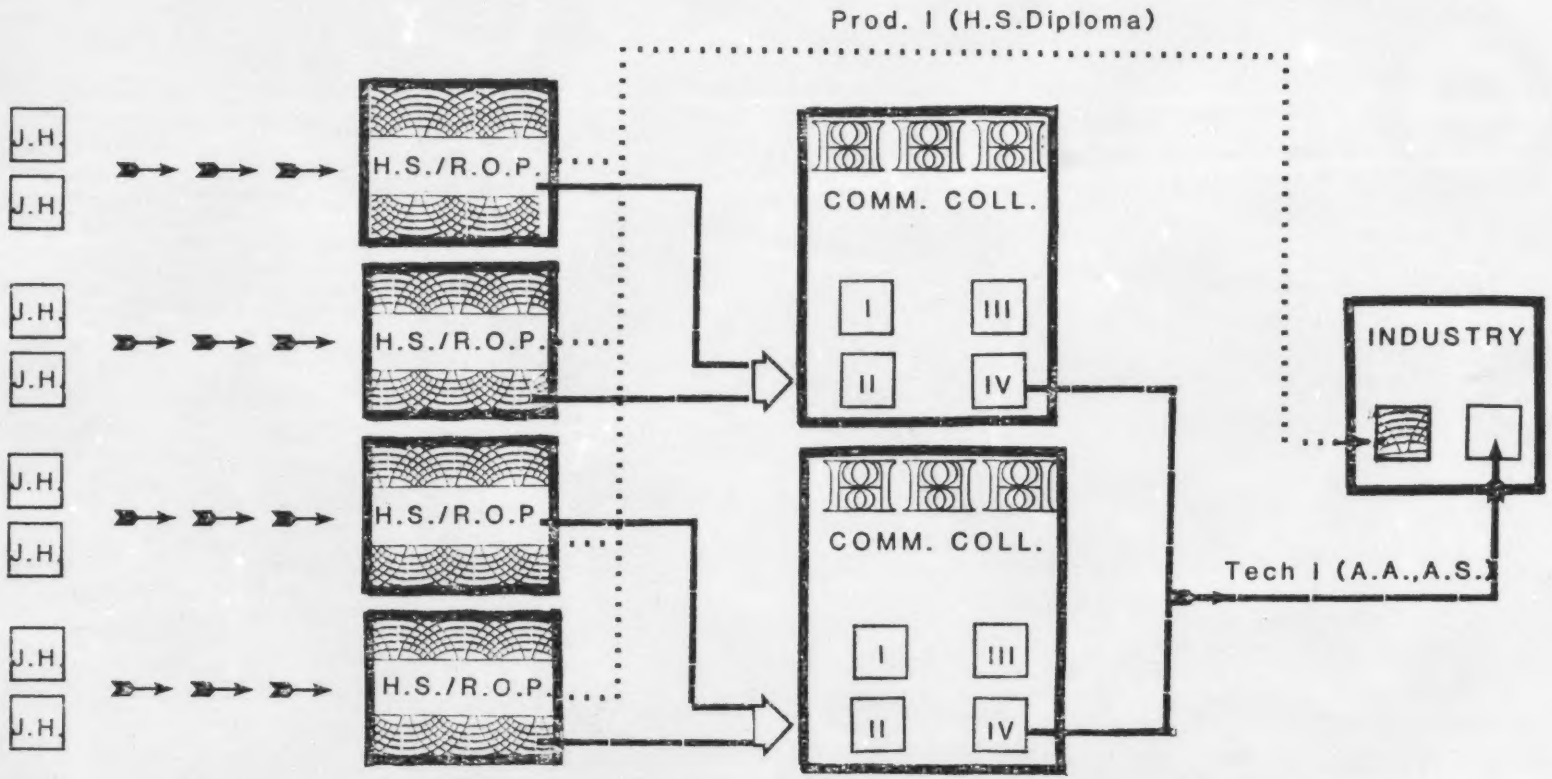
7–14 ARTICULATED ELECTRONICS PROGRAM

COORDINATE COMMUNITY EFFORTS: PROVIDE TWO LEVELS OF EMPLOYEES FOR INDUSTRY



PROJECT PRESENTATION AND INSERVICE DATES

January 1981	ARC Instructor Inservice
March 1981	ARC Instructor Inservice
April 1981	California Industrial Education Association (CIEA) San Jose, California
May 1981	ARC Instructor Inservice
May 1981	California Council of Electronics Instructors (CCEI) Carson City, Nevada
October 1981	ARC Instructor Inservice-10th Grade Female Students
November 1981	ARC Instructor Inservice
December 1981	Inservice - Counselors - Secondary - College
January 1982	ARC Inservice-10th Grade Female Students
April 1982	ARC Instructor Inservice

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VOCATIONAL EDUCATION
SERVICES

LOS RIOS COMMUNITY COLLEGE DISTRICT

Mrs. Grace Ohlson - Board President
Dr. David Mertes - Chancellor/Superintendent

AMERICAN RIVER COLLEGE

Dr. Robert Jensen - President

Myron Nadolski
Project Director

Marsha Hart
Assistant Project Director

Dean O'Brien
Department Chairperson - Electronics

VEA Sub Part 3 Project 34-67371-3-0-305

Public Law 94-482

Chris Almeida - Consultant
California State Department of Education
Project Monitor

INTRODUCTION

This project has been a true community effort. Each participating school district disregarded its own turf and joined with its neighbor to establish a secondary-postsecondary-industry cooperative effort to establish an electronics training base for technicians in the 80's.

A special thanks is in order to Doug Stone of Hewlett-Packard and David Dunham of General Electric for sound industry input and encouragement. To Dr. David Montague for his leadership as chairman of the Sacramento County Regional Occupational Program Steering Committee and its members who represent all of the vocational education administrators for Sacramento area school districts. It was this forum that was used to solve the administrative problems, both financial and personal, in establishing the articulation process. We feel that this effort is a resounding success because of the community college, five high schools and one junior high school, that have the articulation system working today.

The junior high is accomplishing what we expected of it, exposure to careers in electronics for minorities, handicapped, disadvantaged and non-traditional roles for female students.

The continued success and expansion of this effort is assumed because of the attitude and commitment of the junior high, high school and community college teachers, all working together for the entire community.

The project success was due greatly to Dean O'Brien, Electronics Department Chairperson, and instructor, Marsha Hart, who acted as Assistant Project Manager and pulled everything together.

SACRAMENTO COUNTY ROP STEERING COMMITTEE

Al Gray, Galt Joint Union High School District
Norm Newman, Elk Grove Unified School District
Virgil Jensen, Folsom Cordova Unified School District
Ron Hackett, San Juan Unified School District
Del Firme, Sacramento County
Marvin Delfendahl, Grant Joint Union High School District
Fran Rosen, Sacramento City Unified School District
David Montague, Sacramento County
Robert Tomasini, River Delta Unified School District
Ken Sahl, Roseville Joint Union High School District
Jack Jenkins, Sacramento County
Harvey Fischer, Sacramento City Unified School District
Ed Crandall, Washington Unified School District
Myron Nadolski, American River College

....the electronics industry complains that educational institutions are not producing enough graduates in areas of high technology....

....Mutual responsibilities between education and industry?

Industrial Representatives:

David N. Dunham
Test Supervisor
General Electric Co.
Rancho Cordova

Doug Stone
Production Manager
Hewlett Packard Co.
Rocklin

INDUSTRY

PROBLEM ASSESSMENT:

Technological changes over the past 15 years have been likened to the development of the steam engine. The industrial revolution in electronics has created a shift in the demand for various job skills. To date, industry has been highly critical of the seeming lack of response from educational systems to their critical shortages of qualified personnel, in specialized areas. Community colleges fall short of supplying the number of entry-level electronic technicians. An estimated 20,000 openings exist for qualified candidates throughout the state. Universities appear to fair no better. A recent study indicated that industry is "... most concerned about the acute shortage of engineers and computer science graduates from undergraduate and post-graduate degree programs...Nationwide, U.S. institutions of higher education in 1981 generated only one quarter of the four year computer majors sought by industry, only one tenth of the Master's graduates required and one quarter of the Ph.D.s needed..." [1]

MODEL ANALYSIS:

....What responsibilities should exist between the educational system and industry?....

Responsibilities appear clearly defined upon realization that the graduates of our various educational institutions require employment. The entry-level work force is predominantly recent graduates of various levels of training. Those entry-level skills required for industry are developed throughout the educational process. Changes in industry and its associated technology require continual re-evaluation of curriculum with a consideration of modification, where necessary, to maintain a proper balance of supply and demand. "Since the industry structure of an area is the principal determinant of the occupational mix of the local labor force, changes in this industry structure will, in turn, alter the occupational skills required by employers in the labor market area. The composition of industries in the area may change over time due to the movement into and out of the area, and technological change." [2]

Development of entry-level skills is a gradual process requiring the coordination of curriculum between a minimum of two levels of education, frequently three or more. Success of this effort is ultimately measured by the employability of the graduates, at the end of the line. How well do their skills meet the needs of industry? Multi-level education and its associated complexity requires open lines of communication between representatives from local industry and all levels of education. Anticipation of future changes in technology can limit the "lag time" inherent in curriculum development required to maintain the "status quo". Feedback from industry can also serve to minimize the impacting of careers. Information from industrial representatives can provide realistic career guidance to students during their formative years. Interviews with various age groups suggests that most students will have selected a career before entering their senior year, in high school. They appear most receptive to serious career investigation at the tenth grade level. Appropriate information, at the right time, can better prepare students for their futures. Alternatives for already impacted careers can be seriously con-

sidered; realization that pursuit of a career with limited opportunities will require outstanding academic performance is necessary for those who choose to be competitive. The result of this interaction with industry will increase the likelihood of a qualified entry-level work force.

PROPOSAL:

1. Enlist the support of representatives from local industry to help increase public awareness of the shortage of personnel in high technology. Realistic entry-level educational requirements and associated skills should be presented to high school/ROP electronics instructors, as well as counselors, for dissemination of relevant information to their students.

2. Establishment of an articulation committee representing the various educational administrators and representatives from industry. The role of industrial representatives would be primarily supportive.

IMPLEMENTATION:

1. On-site interviews were conducted at the Roseville Division of Hewlett Packard Co. for the purpose of identifying entry-level skills required for various job classifications. Entry-level production workers on up to supervisory personnel were questioned concerning their qualifications, job duties, job potential and anticipated promotions. Requests for similar information were sent to other electronic companies located in our community area.

2. Establishment of an articulation committee, in October, 1980, was our first opportunity to begin interaction between educational representatives from community college electronics programs, administrative representatives from high school and ROP districts and industrial representatives. Meetings were designed to allow for coordination of the articulation process on a community-wide basis for all school districts expressing interest in participation.

3. In-service training of community college electronics instructors was suggested as a way to ensure maintenace of a curriculum guided toward industrial needs.

RESULTS:

1. Information was gathered from various sources regarding career opportunities in high technological areas. A recent report published by the State of California, "Projections of Employment, 1980-85", for the Sacramento community area anticipates increased growth of the electronics industry. "...the demand for technical engineers will increase, with the manufacturing industry group providing the largest number of job openings. Occupations such as electrical, mechanical and industrial engineers will reflect the greatest demand as new firms

locate in the Sacramento SMSA and existing concerns expand."[3] Confirmation from various representatives of Santa Clara-based companies indicates that Sacramento is, indeed, an area seriously considered for future expansion.

Educational requirements were verified by interviews with industrial representatives. Industry appears to place considerable importance on college training. Technicians are required to have a minimum of an A.A. or A.S. degree. Although equivalent experience is generally accepted, it is anticipated that this practice will be phased-out in the future. Engineers are required to have a minimum of a B.A. or B.S. degree. Promotional considerations are directly associated with on-the-job experience, as well as educational training. Prospects for the high school graduates are minimal. Interviews with industrial representatives suggested that the maximum earnings for high school graduates would approximate the entry-level wages for college graduates. Graduates from accredited vocational programs would find unlimited promotional opportunities, with additional schooling, most often paid for by the employer. Employers feel it is to their advantage to encourage their employees to obtain additional education, and most practice promotion-from-within. Four-year college graduates offer potential as entry-level engineers. Post-graduate degrees offer, as incentive, the potential for management positions.

2. Response from industry to our articulation efforts was very positive. Lika Corporation made a generous donation to our project which saved considerable expense. They provided materials necessary for a major undertaking, considered vital to the successful duplication of our programs. Hewlett Packard was continually providing assistance, at a moment's notice. They frequently provided tours of their facilities for community college and high school administrators.

3. Two electronic instructors from A.R.C., were invited to work during the summer months as technicians for Hewlett Packard, in Roseville. Both accepted the challenge and found the experience fruitful. Their findings confirmed that, overall, our program was up-to-date; but, that certain modifications would increase the suitability of our graduates. Changes are currently underway in the area found lacking - specifically, soldering and de-soldering techniques. An increased emphasis on these skills has been initiated.

4. Hewlett Packard routinely invites the electronics graduating class for a tour of their facilities. A presentation is generally included, followed by an informal dinner.

RECOMMENDATIONS:

Industry has been extremely cooperative and supportive throughout this project. It is essential that a coordinated effort between the community college staff and industry be maintained, and the time required is significant. Our recommendation is to allow release time for the staff member assigned the task of working with industrial liaisons.

.... Funding and staffing problems appear to be the primary burdens facing community colleges....

....the community college as a focal point for efficient education? ....

Community College representatives:

Myron Nadolski, Area Dean
Technical-Vocational Department
American River College
Sacramento

Dean O'Brien, Department Head
Electronics Department
Technical-Vocational Department
American River College
Sacramento

Donald Goff, Area Dean
Occupational Technology
Sacramento City College
Sacramento

COMMUNITY COLLEGE

PROBLEM ASSESSMENT:

Funding and staffing problems appear to be the primary burdens facing the community colleges, today. College districts have minimized the funding available for necessary curriculum adjustments, thus limiting educational response to industrial changes in technology. Staffing has become a problem for programs facing expansion. Qualified candidates are generally unapproachable due to the inability of the college district to compete with salaries offered by industry. Recent graduates from the electronics program at A.R.C. were offered starting salaries, ranging from $15,000 - $24,000, annually. Salaries offered to entry-level electronics instructors, (requiring a minimum of two years recent experience), are comparable.

Electronics programs offered at the community colleges are becoming increasingly impacted, due to opportunities offered by this field of study. With a notable rise in the percentage of re-entry students into the A.R.C. program, the average age of our students is over 30. "Priority" status is required to obtain enrollment into the entry-level electronics courses; non-priority students, principally recent high school graduates, have virtually no chance for enrollment into our program until they obtain a minimum of 25 units at the community college level. Outward appearances suggest that we are seemingly encouraging high school students to become electronic technicians. Once interested, students would find the doors closed to our over-crowded program. Counselors were reluctant to encourage their students to pursue electronics, as a result.

MODEL ANALYSIS: .... What role should be assumed by the community college to facilitate articulation?

Coordination of the articulation process should be assigned to representatives at the community college level. Generally, each college district maintains more than one facility in a populated area. Each community college should consider articulation of their programs with their own feeder high schools. It should be stressed that participation should be on a voluntary basis, for success.

Efficient education requires careful coordination of curriculum between all levels participating in articulation. Observation of students suggests that maximum learning will be achieved through a process involving continual challenge to the individuals - their skills, their thinking capabilities. Emphasis should be on the development of new skills; limit the need for re-training. Entry-level courses to be articulated should display complete duplication of material presented at both levels of education. Students enrolled in high school articulated programs would be given the opportunity to challenge the finals of equivalent college-level courses. If successful, they would receive college credit and be given advanced placement into the community college program. For most high school students, this method offers the only way into the electronics program at American River College.

COMMUNITY COLLEGE

Articulation benefits not only participating high schools, but provides a more efficient flow of students through the community collge program. Generally, only the entry-level courses experience severe over-crowding. Allowing high school graduates advanced placement will alleviate the burden, and, will more effectively serve re-entry students requiring entry-level course work.

PROPOSAL:

1. Consider the community college a focal point for articulation, primarily because of the established relationship with industry.

2. With the realization that funding will not improve, in the near future, consider specialization of programs to be offered at the various community college campuses, within a district. Articulate only the entry-level programs of participating schools.

3. Facilitate the challenge of final examinations of entry-level courses by high school graduates. This will continue to encourage advanced training, while minimizing re-training.

4. To ensure duplication of entry-level electronics programs, provide workshops for participating high school and ROP electronics teachers. This format will provide an informal training session for presentation of materials and procedures used in the program, at A.R.C..

IMPLEMENTATION:

1. Establishment of an advisory committee, in October, 1980, brought representatives from industry together with administrators from the high school and ROP districts to the conference table with community college representatives. Obtaining a committment from all participants would be essential, for articulation.

2. Meetings were set up between the department heads of representative college programs to determine which courses would be offered at each school. Also, agreement that high school graduates could challenge final examinations of entry-level courses at either community college was stressed.

3. Participating A.R.C. staff members donated their time in the preparation of 200 component boards and associated literature to be distributed to participating high school and ROP facilities. Components were provided through the grant, supporting the project.

4. Letters were sent to participating high school and ROP instructors notifying them of the date selected for presentation of the entry-level final examinations. Information concerning general subjects to be included for testing, was also provided.

5. Workshops were scheduled, bi-monthly, for participating electronic

instructors. A.R.C. staff volunteered their services for presentation of curriculum and appropriate testing procedures.

6. High school and ROP instructors were encouraged to apply for part-time employment as laboratory instructors for the community college. this additional exposure would assist the development of necessary training procedures.

RESULTS:

1. The advisory committee was instrumental in minimizing the effects of district boundaries within our community area. From the on-set of this project, the emphasis has been to approach articulation as a community effort designed to improve our educational efforts. Initial interviews conducted with each of the district administrators suggested some hesitance to mutual cooperation. However, doubts were replaced by full cooperation. Results were far greater than any of us anticipated. Given mutual financial restrictions, high school districts and ROP districts combined funding to initiate the process; equipment and facilities were provided by high school districts, while teacher's salaries were financed by ROP. Their efforts have provided electronics training for all interested high school students, throughout the Sacramento community area.

2. Coordination of curriculum at the community college level met with limited success. Two community colleges reside within Los Rios district. To date, only American River College has made a committment to articulation. Interested high school and ROP electronics programs have the availability to articulate with A.R.C., throughout the Sacramento area. Response has been positive, and all districts are represented from Folsom to Elk Grove.

3. Articulation workshops met with surprising success. Materials were distributed to high school and ROP electronics teachers. In addition, A.R.C. staff presented methods of teaching and evaluating, consistent with our program. Initial reaction to our chosen curriculum met with mutual frustration. However, their realization of the importance of entry-level skills, resulted in mutual respect. The past year has been beneficial for all workshop participants. The curriculum presented for articulation had been used, at A.R.C., 10 years ago. Attempts to update resulted in a loss of the basic intent of the course. Articulation required re-evaluation, and it was determined that the original curriculum better suited the needs of our students. To date, duplication of programs is in progress.

4. Entry-level final examinations were presented to articulated students in May, 1981, and again, in May 1982. 1981 showed minimal representation from participating districts. 18 out of 21 students passed both finals, and were given advanced placement into the A.R.C. electronics program. Participation in 1982 was respectable. All participating districts were represented. Out of 45 students, 25 passed both finals; an additional 8 students passed at least one of the examinations. The 1982 graduates

will be enrolled in the Fall '82 semester.

5. The committment displayed by participating high school and ROP instructors has been impressive, to say the least. Each workshop found an increase in the numbers attending. Their interest in upgrading high school curriculum was instrumental in recommending them as candidates for teaching in our evening program. To date, five of the articulated instructors are teaching, part-time, at A.R.C., as laboratory instructors. Two of the original group are currently full-time staff members of our program.

RECOMMENDATIONS:

1. Increased emphasis on community college participation, is recommended. Department Heads and Area Deans would seem best suited for this task. Considerable time will be required for facilitation of articulation, at this level. Therefore, release time should be considered for participants.

2. Release time should also be available for preparation of curriculum materials by community college staff members. Considerable time and effort is required to plan and coordinate a successful program.

3. Dedication and committment are required from at least three individuals at the community college level: the Area Dean, the Department Head, and an electronics instructor, (preferably a minority). A liaison from the high school staff is essential for minimizing obstacles, which might be encountered with high school teachers. A part-time community college teacher would offer a significant contribution toward articulation.

4. Involvement of high school instructors into the community college part-time staff, is highly recommended. Mutual reward is available. The instructors can be indoctrinated into the philosophy of the overall articulation process; additionally, methods of teaching will be more easily adopted. The increased respect from high school administrators and associates adds another incentive for participation. Staffing at the community college is difficult, at best. Participation from selected high school teachers can alleviate this burden, associated with program expansion. Mutual trust and respect develops between the respective faculties.

5. Publicity of successful high school seniors is highly recommended. Awareness that these students received 8 college units and advanced placement into community college programs will serve to increase the credibility of high school electronics programs.

.... Economic burdens faced by secondary school systems require continual re-evaluation of expenditures. Budget cuts have forced re-examination of curriculum to determine which courses can be eliminated....

....High school and ROP administrators combining funds.... working together to improve their mutual educational efforts?

District Administrators:

Ed Crandall
Director of Instruction
Washington School District
Sacramento

Marvin Delfendahl
Director of Instruction
Grant Union High School District
Sacramento

Harvey Fischer
Coordinator
Sacramento City Unified School District
Vocational Education
Sacramento

Del Firme
Coordinator
Sacramento County
Regional Occupational Program
Sacramento

Ron Hackett
Program Manager
Vocational Education - ROP
San Juan Unified School District
Carmichael

Virgil Jensen
Coordinator
Folsom-Cordova School District
Rancho Cordova

HIGH SCHOOL/ROP DISTRICT ADMINISTRATORS

PROBLEM ASSESSMENT:

In a recent letter to his constituency, U.S. Senator, Alan Cranston made the following remarks concerning the quality of education in our nation, today:

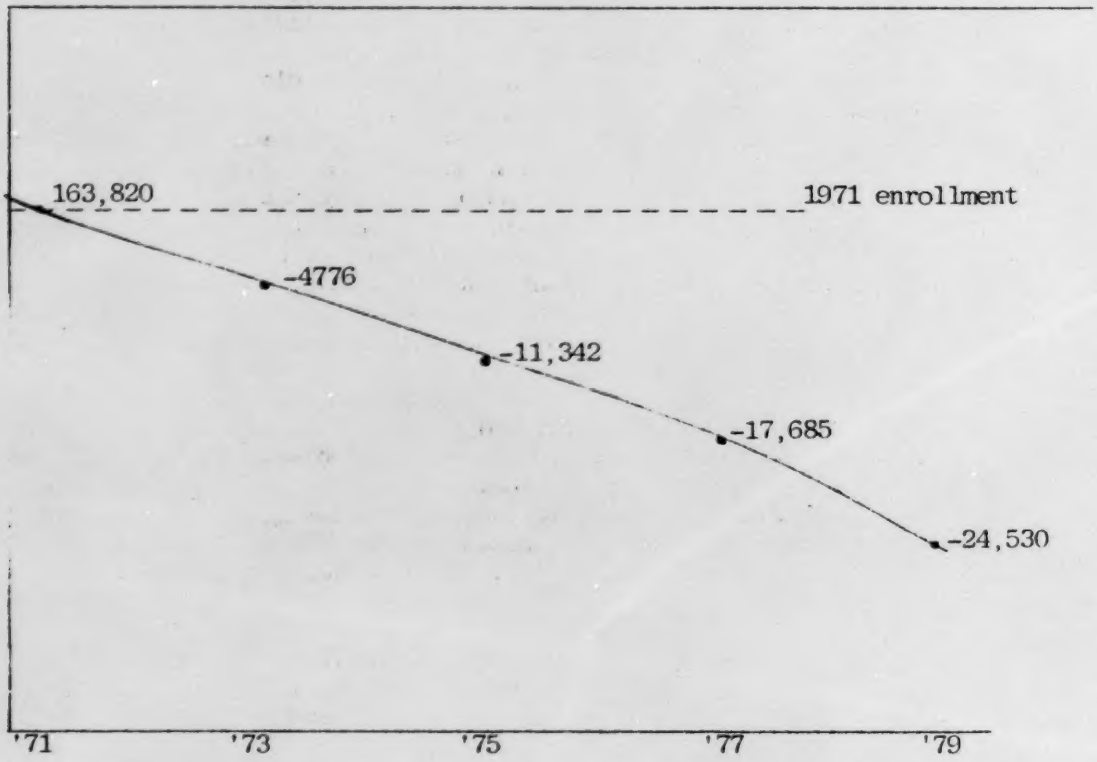
> "...In the last 20 years there has been a dramatic decline in public confidence in the performance of the nation's schools. There is an alarming rate of functional illiteracy even among high school graduates. The average high school curriculum is so weak in science and technology that the U.S. ranks closer to the developing nations of the world than to the industrial democracies we consider our peers.
>
> Numerous studies have tried to pinpoint causes: ... School districts across the country are facing declining enrollments and tight budgets. Schools cannot find and hold onto qualified math and science teachers because they generally don't have the financial resources to compete successfully in the marketplace for the best people.
>
> In addition, schools have been expected to be society's forward line in coping with racism, assimilation of the foreign born, crime, and changes in the two-parent family. Schools didn't ask for these added responsibilities. But the net result is unmistakable. Too often basic skills -- reading, writing and math -- as well as an emphasis on academic excellence, become secondary pursuits."[4]

A recent study conducted in the Santa Clara Valley corroborates the findings of Senator Cranston. In an effort to determine educational response to local industrial needs, the author noted the following, "... The public schools, starved for funds and beset by the conflicting demands of many constituent groups, are moving in a direction opposite to the economic trends in the area..."[5]

How severe is the financial burden facing Sacramento area schools? It is clear that enrollment determines the amount of funding available to school districts; therefore, fluctuations in population density ultimately determine the financial impact on education in a local area. Sacramento has experienced a severe decline in student enrollment over the past ten years, as indicated in Figure 1. Statistics compiled for our area, from 1971-80, show an average yearly loss of 3066 students, totaling over 24,000 lost during the sample period.[6] Interviews with area school district administratiors confirmed the resulting financial dilema, adding that the burden has been further enhanced with the enactment of Propostion 13. Budget deficits totaling $350,000 for the school year, 1981-82, were announced for one severely affected school district. Projections of $900,000 in deficits for the 1982-83 school year forced administrators to begin school closures and consider consolidation of facilities as the only viable solution to the current economic crisis. This action will reportedly save the district $700,000.[7]

Administrators indicated that their budgets have been trimmed down to the absolute minimum required to maintain operable school facilities. Any further budgetary adjustments would necessitate re-evaluation of cur-

Figure 1 represents the enrollment figures for the Sacramento County during the period, · 1971-79. All school districts are represented. Results are plotted with reference to changes from the original data, recorded in 1971.



riculum. A determination would have to be made as to which areas of study could be eliminated from the high school curriculum with minimum impact on affected students. Basic skills -- reading, writing , and mathematics -- are considered essential, and are required for graduation. The only available curriculum for possible elimination would fall under the category of electives, which offer a variety of studies.

To date, interest surveys present the administrators with a determination of which electives will be presented, on a yearly basis. An aware student population would be able to select those courses which are supportive to their career choices. Local interviews with various high school age groups strongly suggested that, for many, committment to a career direction takes place before students enter their senior year. Somewhat surprising results were uncovered in the Santa Clara Valley. Surveys showed that students were interested in pursuing careers which were totally unrelated to the realities of the job market they would encounter in their own area.[8] Comparable surveys presented in the Sacramento area revealed that high school students share all-too similar goals expressed by their Santa Clara neighbors. Selections were traditional —doctors, lawyers, airplane pilots, actors, athletes, to name a few.[9]This apparent lack of responsible career assessment during their formative years has far-reaching impact on the economy and industry of an area. "We face a serious skilled labor crisis in the 1980's in which unemployment will rise even as there is a shortage of skilled persons for key jobs."[10]Examination of current unemployment statistics and the severe shortages in high technology industries is evidence that we are rapidly approaching this crisis.

Electronis is an elective offered in the high school curriculum which is targeted for elimination, due to minimal student interest. Opportunities available in this field far exceed many currently advocated by high school counselors and other academic advisors. Dismay was expressed by district administrators; they were well aware of the career potential available in electronics, but without increased student interest countinued funding of the program could not be justified.

MODEL ANALYSIS: ....With responsible input, high school and ROP district administrators are working together to improve their educational efforts....

Funding is a primary concern at the district level. Responsible evaluation of essential curriculum requires input from industrial concerns as well as from higher education. Establishment of advisory committees would provide necessary guidance, particularly with the dismal economic future anticipated. Articulation of programs with local community colleges offers validity to the curriculum developed. Close association between the community college and its feeder high schools increases the efficiency of the educational process and minimizes the response time to relevant changes in industrial technology.

Consolidation of financial resources available at the secondary level offers a creative solution to limited funding. "...the cooperation between

secondary schools and the Sacramento ROP will make possible the expansion of the training opportunities which, because of the limited financial abilities of the school districts and the Sacramento ROP, neither could do independently.

"The proposed program appears to offer the most viable approach to meeting the needs of both the students and the electronics industry."[11]

PROPOSAL:

1. Establish an advisory committee representing all necessary curriculum advisors -- industrial representatives, community college Department Heads and Area Deans, area high school and ROP district administrators. The purpose of this committee would be to approve and coordinate curriculum development in their respective districts.

2. Working with the administrators, determine methods for increasing student awareness of the career potentials offered in electronics. It would be necessary to increase student interest in electronics for the project to be continued after the initial trial period.

3. Investigate the possibility that electronics could be substituted for the basic science requirement. Credibility would be added to the project with acceptance of this practice.

IMPLEMENTATION:

1. Interviews were conducted with high school and ROP district administrators throughout the Sacramento-Yolo area. These on-site visits served to determine problems perceived as unique to the individual districts; what guidelines must be observed in the articulation project. Representatives were asked to recommend ways that the community college staff could assist in increasing student awareness of electronics and the career potentials offered by this field of study. Additionally, they were asked to consider the feasability of electronics as fulfilling the science requirement.

2. The advisory committee was established in October, 1980, during the initial phase of the state-funded Industrial Education Model 7-14 Project. Various electronics firms were invited to participate with educational administrative representatives from high school/ROP districts and the representatives from the Los Rios Community College district.

RESULTS:

1. The interviews initially conducted emphasized the need to approach articulation as a community. All district representatives made verbal committments to support the project, on a trial basis. Indications suggested particular interest in stimulating minority participation in the program. Recommendations were made and approved for a workshop spec-

ifically limited to tenth grade women; introduction to nontraditional career opportunities would be the focus.

Administrators were asked to consider the substitution of electronics for partial fulfillment of the science requirement, necessary for graduation. To date, one district accepts this policy. Others will require school board approval, which is likely only with successful demonstration of articulation.

2. Establishment of the advisory committee has proven a successful way to reaffirm community cooperation. Due, in large part, to the efforts the the Technical-Vocational Area Dean at American River College, more has been accomplished to break down district barriers than ever anticipated. The isolation previously experienced by high school districts in our area appears diminished, as a result. Lines of communication were opened, significantly, between area high school and ROP administrators. Results provided a significant contribution toward solving mutual financial problems. Folsom-Cordova school district, a recent addition to our articulation project, displays the consolidation efforts:

> "...vocational skills training for entry-level employment and/or preparation for training at the technical level will be provided through the cooperative efforts of the secondary schools and the Sacramento ROP. In this effort, the secondary schools will make available the needed physical facilities and capitol equipment. The Sacramento ROP will provide program coordination, funding for instructional personnel and supplies, inter-school student transportation, counseling and guidance, job placement and other support services provided to all ROP programs. This cooperative effort, which provides the most effective use of facilities, personnel and funds, will ensure that students in all secondary schools in the Sacramento area will have the availability of pre-technical electronics training."[12]

Cooperative efforts resulted in completely equipped facilities at the beginning of the spring '82 semester for all represented districts. Current efforts are underway to provide similar opportunities in the Elk Grove school district, another addition to our project.

RECOMMENDATIONS:

1. Approval and support from participating districts is essential. We strongly recommend that a community-supported effort offers each district a chance to show their often-critical constituents their committment to improving the educational process. Success of the project will then be the burden assigned to high school/ROP and community college electronics staff coordinating proper presentation of pertinent skills to participating students. Success will ultimately be measured by the successful challenge of the entry-level finals offered at the community college.

2. The development of an industrial advisory committee is essential for any realized success. Active participation from the community

college Technical-Vocational Area Dean, as well as the Electronics Department Head served to emphasize the validity of the project. Representation by industrial concerns futher served to lend credance to our efforts.

....High school teachers continually face the threat of the "surplus list"...
...Isolation from the community college and industry has made them unsure of the level of technical ability required for their students...

...High school/ROP electronics instructors articulating with the community college to ensure credibility and increase student interest...

High School Electronics Teachers:

Jim Carney
Marconi Tech, ROP
Sacramento

Jerry Clark
ROP
Sacramento

Ron DeBernardi
La Sierra High School
Carmichael

Larry Doughbetee
Peter Lassen Jr. High School
Sacramento

George Gridley
Kennedy High School
Sacramento

Irving Jameson
Albert Einstein Jr. High School
Sacramento

Gery Harkins
Rio Linda High School
Rio Linda

Everett Lee
El Camino High School

Dennis Johnson
Vacaville High School
Vacaville

Jerry Maddox
Sam Brannan Jr. High School
Sacramento

Bob Mathison
Bella Vista High School
Fair Oaks

Lee Pierce
Folsom High School
Folsom

David Thompson
Mira Loma High School
Sacramento

Jim Thompson
Cordova High School
Rancho Cordova

Jim Theoboldt

Sacramento

Dennis Turner
Foothill Farms Jr. High School
Sacramento

Dean Pitts
ROP
Sacramento

Mike Sagie
Rio Linda High School
Rio Linda

HIGH SCHOOL TEACHERS

PROBLEM ASSESSMENT:

Budgetary deficits experienced by secondary districts ultimately required curriculum re-evaluation. Results of student interest surveys became the determining factor for selection of electives to be presented, on a yearly basis. The significant declining enrollment, together with the minimal student interest in electronics, found many teachers re-assigned to other industrial arts programs supported by sufficient student enrollment. Re-assignments were considered the first step toward the "surplus list", and, ultimately, unemployment. For most, careers in teaching electronics were well established; the threat of re-training into another area was rapidly becoming realized.

Area teachers expressed considerable frustration over the deterioration of necessary equipment, vital to their curriculum. Attitudes of administrators and counselors were perceived as counterproductive; teachers felt that their programs had become "dumping grounds" for students with disciplinary problems; students with academic potential were not counseled into electronics. Most concurred that teaching responsibilities has been replaced with "police duties". The resulting dilema only served to further discredit their programs. There seemed no way to encourage college-prep students into this field that offered realistic career opportunities. And, without increased student interest, the program was doomed to elimination.

Responsible curriculum guidance was unavailable from higher educational institutions, as well as industry. Training for most of the teachers was limited to that received in their own educational preparation--theoretical in nature. Attempts to update their programs involved seminars presented through organizations such as C.I.E.A. or C.C.E.I.. Relevant information was provided from educational supply vendors at sponsored conventions; the addition of digital and computer technology to their curriculum would produce a high school graduate with a lucrative career as an electronics technician. The results of their efforts were far below their expectations, however. High school graduates required re-training in basic skills, upon entering the community college; minimum wage and minimal opportunities became realities for the high school graduates seeking employment.

MODEL ANALYSIS: .....Articulated curriculum development at the community college will focus on current and future needs of industry. Dup[illegible]ation at the high school level will remove the burden from high school teachers.....

For participating communities, articulation can offer new meaning to the educational process. Selected high school programs are recognized by the community college, learning conditions are optimized for participating students--the continual challenge of new skills, with minimization of re-training.

HIGH SCHOOL TEACHERS

Ultimately, successful articulation will depend on the proper co-ordination of curriculum between the community college and participating feeder high schools. Specifically, the burden will rest with the respective faculties. Co-ordination involves assignment of responsibilities, according to the resources available at the respective facilities. Curriculum development at the community college can focus on the current and anticipated needs of industry, with modifications made as changes in technology are realized. Duplication of the community college program at the high school will ensure that participating students are adequately prepared for advanced studies.

It becomes immediately apparent that co-ordination will require far more than a curriculum package. Workshops will be necessary for presentation of the curriculum and associated hardware aids. Methods of teaching and evaluation must be imparted to the high school teachers, as well. The extensive time investment required for this operation will, however, be well worth the effort - a close working relationship between respective faculties will be developed. New direction and support will become available to high school teachers; they will no longer be isolated.

PROPOSAL:

1. Evaluate the high school electronics curriculum and determine which areas could overlap those presented at American River College. Those courses adequately covered would be eliminated from the college requirement if participating students successfully challenged the final examinations.

2. Re-assess the role of the high school electronics program. Determine the required level of competency for graduates of these programs. Using the community college to close the existing gap between high school and the electronics industry, realistic entry-level skills can be made available to high school/ROP teachers.

3. Work with the high school/ROP teachers to determine how the community college staff can assist in stimulating student interest in their electronics programs. Counseling staff should be included in any promotion aimed at increasing student awareness of career potentials offered by electronics.

IMPLEMENTATION:

1. Workshops were scheduled on a bi-monthly basis for participating high school teachers and the American River College staff. Programs were designed to present realistic guidelines for high school curriculum. Laboratory manuals and supportive hardware were provided to each paticipating school.

2. Interviews were conducted with various industrial representatives to determine realistic entry-level skills required of their employees. Additionally, they were asked to provide information

regarding promotional opportunities for various job descriptions.

3. Student awareness was approached through a career workshop aimed at 10th grade women. Invitations were sent to ten Sacramento high schools, each representative counselor was asked to publicize the workshop and select nine 10th grade women to participate.

RESULTS:

Initial discussions with high school teachers revealed what we considered to be a significant problem in the area of course content. Our analysis concluded that they were attempting to train their students to the technician level upon graduation from high school. Consultation with industrial representatives concurred with our assesment that successful technician candidates possess a minumum of an A.A./A.S. degree from an accredited community college program. Close examination of the available classroom hours would allow for presentation of our entry-level courses, Electronics 30 and Electronics 51, only. Anticipated resistance to our position was realized. Most of the participants were proud of their programs.

Additionally, they felt that disciplinary problems would be intensified if they were forced to return to the "basics". Their intent was to introduce our third semester curriculum, involving digital and computer programming, to their students as a solution to motivational problems. The argument presented to the Department Head of the American River College electronics program suggested that problems faced by high school/ROP teachers could not be understood by the community college staff; allowances should be made for the different path they would need to take to achieve the same results. The position taken by our Department Head was specific. In fact, American River College could not fully realize the problems faced by high school/ROP teachers. Our entry-level requirements would not be lowered, and although high school programs would receive as much help as we could provide, their students would be given no special consideration. Articulation would require that college-level standards be maintained for any credibility to be assigned to our project. The reward for successful students would be college credit. The high school electronics program would receive increased respect and interest.

The burden of success was placed onto the high school/ROP teachers. They were not asked to change their programs; the quality of their curriculum would be verified with the success of their students' challenging the entry-level final examinations. To their credit, the high school/ROP teachers participated regularly in the workshops. Each workshop showed an increase in the numbers attending. Discussions became an important part of the programs. A lot of mutual frustration was aired, from high school as well as community college staff. Our relationship strengthened with succeeding workshops, due in large part, to a model articulated program already established at an ROP center in Sacramento. The ROP teacher was also a part-time instructor in the

evening program at American River College. Changes in his program became necessary, and modification was quickly accepted by the other participants as soon as he adopted our format.

Entry-level finals for Electronics 30 and Electronics 51 were presented at the campus at American River College in May, 1981. Students represented three high school/ROP programs. A total of twenty-one students challenged the finals and eighteen were successful. May, 1982 showed participation from all articulated programs in our area, twenty-five out of forty-five passed both exams, while an additional eight students passed one of the exams presented.

RECOMMENDATIONS:

1. The enthusiasm exhibited by participating high school teachers suggested that the workshops offered them a viable solution to an otherwise dismal future. Participants from American River College found the experience equally rewarding. The informality of a workshop is highly recommended for initiating the articulation process.

2. A liaison from the high school level proved to be of valuable assistance to our project. Teaching part-time at American River College allowed him a unique perspective, and through his efforts the articulation process took far less time than anticipated. Five of the high school/ROP teachers are currently teaching part-time in the evening program at American River College. Mutual benefits are the result; high school teachers have a model format to follow, American River College now has a capable part-time faculty pool.

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